

Claim Amendments

Claim 1 (currently amended): An apparatus for producing a volumetric display comprising:

a scanning collimated light source that creates an image by illuminating a suspension of light-scattering particles in an optically transparent medium with a collimated beam, where the brightness of the collimated beam is modulated at each moment in time by an amount that is dependent upon the momentary direction of the beam and also on the distance of the scattering particle from the light source encountered by the beam at that moment, the beam includes a first, monitoring, collimating beam used to detect the presence of the particle, and a second, illuminating, beam is used to illuminate the detected particle.

Claim 2 (original): An apparatus as described in Claim 1 wherein the collimated light source is a laser.

Claim 3 (original): An apparatus as described in Claim 2 wherein the optically transparent medium is air.

Claim 4 (currently amended): An apparatus as described in Claim 3 wherein the light-scattering ~~medium is~~ particles are suspended dust.

Claim 5 (original): An apparatus as described in Claim 4 wherein the light source includes rotating mirrors or resonantly vibrating mirrors, which effect the scanning or some combination of rotating mirrors or vibrating mirrors.

Claim 6 (original): An apparatus as described in Claim 5 wherein the scanning by the light source is two-dimensional, thereby sweeping out a volumetric display region.

Claim 7 (currently amended): An apparatus as described in Claim [[6]] 31 wherein the beam includes a first, monitoring, collimating beam used to detect the presence of the particle, and a second, illuminating, beam is used to illuminate the detected particle.

Claim 8 (currently amended): An apparatus as described in Claim [[7]] 6 wherein the monitoring beam is outside of the visible spectrum.

Claim 9 (original): An apparatus as described in Claim 8 wherein the spectrum is an infrared portion of the electromagnetic spectrum.

Claim 10 (original): An apparatus as described in Claim 9 wherein the illuminating beam may vary in color.

Claim 11 (original): An apparatus as described in Claim 10 wherein the light source includes a red, green and blue laser that produce three independently modulated contributions for color.

Claim 12 (original): An apparatus as described in Claim 11 wherein the contributions from the red, green and blue laser are combined into a single beam path.

Claim 13 (original): An apparatus as described in Claim 12 including a dichroic beam combiner, which combine the contributions.

Claim 14 (original): An apparatus as described in Claim 13 including a computer memory in which a three dimensional volumetric model of illuminance is stored, and in which the direction of the beam and the distance of the particle along the beam are used to index into this volumetric model to determine a brightness setting for the illuminating beam.

Claim 15 (original): An apparatus as described in Claim 14 including an optical detector is used to measure the light from the monitoring beam which a particle has scattered.

Claim 16 (original): An apparatus as described in Claim 15 wherein the optical detector measures the distance of the detected particle along the monitoring beam.

Claim 17 (original): An apparatus as described in Claim 16 wherein the optical detector is collinear with the optical beam, so that returning light which is scattered directly back along the beam path is visible to the detector.

Claim 18 (original): An apparatus as described in Claim 17 wherein the returning light is focused by a focusing means wherein the focusing means includes a convex lens, and measurement of the distance between the focusing device and the point of focus of the returning light is used to determine the distance along the beam of the detected particle.

Claim 19 (original): An apparatus as described in Claim 18 wherein the light source produces scanning beams that are used to simultaneously illuminate two or more suspended particles within the same volume.

Claim 20 (currently amended): An apparatus for producing a volumetric display comprising:

a light source for providing light, the light source includes an infrared switchable visible-light laser; and

means for producing a volumetric image with the light from the light source.

Claims 21 and 22 (canceled)

Claim 23 (currently amended): An apparatus as described in Claim [[22]] 20 wherein the producing means includes an optical component for merging the beams of the two lasers.

Claim 24 (original): An apparatus as described in Claim 23 wherein the producing means includes computer control for switching the visible-light laser.

Claim 25 (original): An apparatus as described in Claim 24 wherein the producing means includes a time-varying optical beam steering mechanism.

Claim 26 (original): An apparatus as described in Claim 25 wherein the producing means includes computer control for time-varying optical beam steering.

Claim 27 (original): An apparatus as described in Claim 26 wherein the producing means includes linear infrared-sensitive optical position sensor.

Claim 28 (original): An apparatus as described in Claim 27 wherein the producing means includes suspended dust particles in the air.

Claim 29 (currently amended): A method for producing a volumetric display comprising the steps of:

producing light from a light source; and

producing a volumetric image with the light from the light source illuminating dust particles in an optically transparent medium.

Claim 30 (new): A method as described in Claim 29 wherein the producing light step includes the step of modulating at each moment in time brightness of a collimated light beam that is dependent upon the momentary direction of the beam and also on the distance of the dust particles from the light source encountered by the beam at that moment.

Claim 31 (new): An apparatus for producing a volumetric display comprising:

a scanning collimated light source that creates an image by illuminating a suspension of dust particles in an optically transparent medium with a collimated beam, where the brightness of the collimated beam is modulated at each moment in time by an amount that is dependent upon the momentary direction of the beam and also on the distance of the scattering particle from the light source encountered by the beam at that moment.

Claim 32 (new): A method for producing a volumetric display comprising the steps of:

producing a light beam from a light source wherein the beam includes a first, monitoring, collimating beam used to detect the presence of the particle, and a second, illuminating, beam is used to illuminate the detected particle; and

producing a volumetric image with the light beam from the light source.